Figs. 3(1) – 3(2) show cross-sectional views of a first semiconductor chip and a second semiconductor chip that are connected to one another in accordance with an embodiment of the present invention..

Figs. 4(1) – 4(4) show manufacturing steps in which monocrystal silicon having a crystal orientation face of (110) is used for a first semiconductor chip 12 in accordance with an embodiment of the present invention.

Fig. 5 shows an apparatus structure in which holes 26 are formed by an anodic forming method in a first semiconductor chip 12 that has N-type monocrystal silicon as a base material in accordance with an embodiment of the present invention.

Figs. 6(1) – 6(4) show manufacturing steps for forming a metal film in the holes 26 of the first semiconductor chip in accordance with an embodiment of the present invention.

Detailed Description

Certain embodiments of the present invention are designed to overcome at least some of the problems of the conventional technique, and it is an object of certain embodiments of the present invention to electrically connect semiconductor chips in stacked layers to one another without using wires.

One embodiment relates to a method for manufacturing a semiconductor chip and is characterized in comprising the steps of forming an electrode on a surface of a semiconductor chip, and then digging a hole from another surface such as a rear or opposite surface of the semiconductor chip until the electrode is exposed. A conduction member may be inserted in the hole formed in the semiconductor chip, and the conduction member is brought in contact with the electrode to establish electrical conduction between the two. As a result, the path between the electrodes becomes shorter and therefore signal delays are inhibited or prevented.

A method for manufacturing a semiconductor chip in accordance with another embodiment is characterized in comprising: forming an electrode on a surface of a first semiconductor chip and thereafter digging a hole from another surface such as, for example, an opposite surface of the first semiconductor chip, until the electrode is exposed, forming a protrusion by etching on a surface of a second semiconductor chip and thereafter forming an